later, as the storm was crossing northern Luzon, velocities over 100 k. p. h. were recorded at Manila and Cebu, the directions always being from the southwest, west, or northwest quadrants at these stations. It seems to the writer that the air stream over the southern part of the archipelago was not only being attracted toward the typhoon center, but also was being impelled toward the disturbance by forces far to the southwest of the Philippines, both of these tendencies making the storm very intense. Observations from the Straits Settlements and the Netherlands East Indies are not available for confirming these impressions.

Depression, August 19–25, 1940.—A low-pressure area appeared far to the southeast of Guam, moved west, then west-northwest as a depression, and disappeared about 400 miles northeast of San Bernardino Strait. This disturbance did not manifest any signs of intensification.

Typhoon, August 20–27, 1940.—A depression appeared about 350 miles north of Yap and moved northwest, rapidly intensifying to typhoon strength. When about 120 miles south-southeast of Naha, Nansei Islands, it changed its course to the north, then later recurved to the east-northeast when it reached the regions about 120 miles west-northwest of Oshima, Nansei Islands. The storm then moved almost parallel to the coast line of Japan, entering the mainland, however, and passing west of Tokyo on its course toward the northern Pacific. By August 27, it seemed that the storm had degenerated into a mild low-pressure area, moving northeast.

When the typhoon was moving over the Eastern Sea and adjacent regions, the lowest pressure plotted on the weather map was the afternoon observation of August 23, from Naha, Nansei Islands, a value of 740.0 mm. (986.6 mb.) with northwest winds of force 6. No reports of extensive damage due to this typhoon were published.

Typhoon, August 23–September 4, 1940.—As a depression, central about 250 miles east-northeast of Guam, August 23, at 2 p. m., this storm moved west-northwest, then west, then southwest, rapidly intensifying to typhoon strength. When the center reached the 14th parallel of latitude, it again moved west, shifting to the west-northwest at longitude 134°. This brought the storm center to the eastern portion of the Balintang Channel, where it inclined to the north. The center avoided the town of Basco, Batan Islands, and continued toward Formosa. As well as could be determined, the typhoon passed over northern Formosa, moving northwesterly, and continued toward China. On August 31, the center entered China close to Foochow, and recurved to the northeast during the next 2 days. This caused the storm to pass about 150 miles west of Shanghai on its way to the Yellow Sea, Chosen (Korea), and the Sea of Japan, where it disappeared on September 4.

The minimum pressure at Basco, Batan Islands, was 740.6 mm. (987.4 mb.), at 3 a. m. August 30, with west-southwest winds of force 6. On August 31, at 2 p. m. (Manila time), Foochow reported north winds of force 10, with pressure at 734.0 mm. (978.6 mb.).

The upper winds at Guam hardly reached velocities as high as 40 k. p. h., as this storm approached the vicinity of the station, but it must be noted that the weather was unfavorable for long ascents. On August 25 velocities up to 54 k. p. h. were reported, direction south-southeast, and weakening the next day. It might be remarked that there were no strong velocities reported from this station during the whole month, when three storms passed by these ocean regions. Over the Philippines, the southwesterly air stream, quite strong as the typhoon approached, was intensified somewhat on August 28 and following days, but not to the strength manifested during the typhoon of August 14 to 24.

RIVER STAGES AND FLOODS

By Bennett Swenson

Outstanding during August were the severe floods in the rivers of southern Virginia, North Carolina, and portions of South Carolina, Georgia, and eastern Tennessee. These floods resulted from excessive precipitation accompanying the passage inland of a tropical disturbance near Savannah, Ga., on August 11. The disturbance moved slowly to the southern Appalachian Mountain region and on the 13th turned and moved slowly eastward along the North Carolina-Virginia border, passing out to sea again on the night of the 17th. (See pp. —— for a complete report on the hurricane.)

As is common with the slow movement of any disturbance where there is a strong convergent influx of warm moist air, the cumulative rainfall amounts were exceedingly high. The rainfall was heaviest over the mountains due to the extra uplift of moist air caused by the mountain slopes.

The rivers most severely affected were the James, Roanoke, Tar, New River in Virginia, Tennessee Valley above Knoxville, Tenn., and other streams rising in the eastern slope of the mountains in western North Carolina. Previous high stages of record were exceeded at a number of places. At Weldon, N. C., on the Roanoke River, a stage of 58 feet was reached on August 18, exceeding the great flood of 1877 by about 5 feet at that place.

Floods of lesser magnitude occurred in the Neuse, Cape Fear, Peedee, Santee, Savannah, and Altamaha River systems.

By reason of the difficulty in securing and preparing the necessary meteorological and hydrologic data for publication, a detailed account of these floods will be given in a later issue of the Review. The dates above flood stages and the crest stages are given in the table at the end of this report.

FLOODS IN OTHER RIVERS

East Gulf of Mexico Drainage.—Stages in the Chattahoochee and Flint Rivers remained at low stages, except in the upper portion, despite excessive rains in portions of northern and eastern Georgia. The only station reporting stages above flood was Norcross, Ga. on the Chattahoochee River, and this lasted only briefly.

The Etowah River at Cartersville, Ga. reached a stage of 19.8 feet (flood stage 18 feet) on the 14th.

The Pearl River had dropped below flood stage at the beginning of the month except at Pearl River, La. where flood stages continued until August 9.

Ohio River Basin.—In addition to the flood in the French Broad River on August 13 and 14, another occurred on August 29 to 31. The second was the more severe and was due to exceptionally heavy rainfall confined almost entirely to the headwaters of that basin. The 24-hour rainfall amounts ending at 7:30 a. m. of the 30th were 12.10 inches at Mount Mitchell and 6.78 inches at Asheville, N. C. However, the crest stage in the Tennessee River at Knoxville, Tenn. in the second rise was lower than in the first due largely to the fact that in this case the discharge of the Holston River was not as great.

The New River in Virginia and West Virginia, a tributary of the Kanawha River, which experienced unusually high stages as a result of the heavy rains accompanying the movement inland of the hurricane

mentioned previously, rose again to slightly above flood stage in the upper portion at the end of the month. A complete report of these floods will be given later.

Arkansas Basin.—A flash flood occurred in the upper North Canadian River on August 9. A total loss of $11,500 was reported.

West Gulf of Mexico drainage.—The following report has been submitted by the official in charge, New Orleans, La. regarding excessively heavy rains and floods in southwestern Louisiana on August 6 to 9:

The heaviest 4-day rainfall that has been recorded in the Southern States, as far as we are able to determine, occurred in connection with the tropical hurricane [1] that crossed the coast line with center just east of Sabine, Tex. on August 7. When the storm turned northward over extreme southeast Texas and slowed down in its forward movement from the 7th to the 9th the heaviest rainfall occurred more than 100 miles to the right of the path of the center. The rainfall was heaviest in the Crowley-Abbeville-Lafayette section in Louisiana with daily amounts as follows:

August—	Crowley [2]	Abbeville	Lafayette
6–7	4.32	4.30	1.62
7–8	9.36	8.80	4.06
8–9	19.76	17.50	19.63
9–10	.27	1.06	1.64
Total	33.71	31.66	26.95

[1] See pp. 217 for report on hurricane.
[2] Official record at Crowley not obtained because of flood conditions. Record is from Mr. F. E. Everett's gage, described as a good gage.

The 24-hour falls of 19.76 inches at Crowley and 19.63 inches at Lafayette on the 8–9th, have been exceeded in this State only by the record fall of 21.40 inches at Alexandria on June 15–16, 1886.

The water began to recede at Abbeville on the 9th after a stage of 14.32 feet, mean gulf level, was reached on the Vermillion River at the Southern Pacific railroad bridge. Crowley was largely evacuated; the water there began to fall slowly on the 10th, having reached a depth of 8 feet in some parts of the Crowley area. The flood drained slowly to the Gulf through the various streams

Colorado Basin.—Flood stages were reached at Kelvin, Ariz., on the Gila River on August 14 and 15. A flash flood occurred in the vicinity of Tucson, Ariz., during the night of August 13, following a heavy local rainfall of 2.35 inches within 70 minutes. Losses from the latter flood have been estimated at $125,000.

FLOOD-STAGE REPORT

[All dates in August unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
James:	*Feet*			*Feet*	
Lynchburg, Va.	18	16	16	18.4	16
Bremo Bluff, Va.	19	15	19	33.5	17
Columbia, Va.	10	15	21	35.4	17
State Farm, Va.	12	16	20	25.6	17
Richmond, Va.	8	16	20	23.3	18
Dan:					
Danville, Va.	11	14	17	21.2	15
Clarksville, Va.	13	15	19	27.0	17
Roanoke:					
Randolph, Va.	21	15	20	[1] 41.6	16
Weldon, N. C.	31	15	23	58.0	18
Williamston, N. C.	10	18	Sept. 2	20.4	22
Fishing Creek: Enfield, N. C.	14	15	20	17.9	18
Tar:					
Rocky Mount, N. C.	8	14	20	13.2	18
Tarboro, N. C.	18	16	25	30.5	20
Greenville, N. C.	13	17	27	22.2	22

[1] Estimated.

FLOOD-STAGE REPORT—Continued

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE—CONTINUED					
Little: Kenly, N. C.	*Feet* 9			*Feet* 15.8	19
Neuse:					
Neuse, N. C.	14	15	19	16.8	16
Smithfield, N. C.	13	15	21	19.0	17
Goldsboro, N. C.	14	16	24	19.2	22
Kinston, N. C.	14	21	26	16.1	25
Cape Fear: Lock No. 2, Elizabethtown, N. C.	20	16	20	26.0	18
Pee Dee:					
Cheraw, S. C.	30	16	18	37.7	17
Mars Bluff Bridge, S. C.	17	17	25	21.1	22
Poston, S. C.	18	22	27	19.4	24–25
Saluda:					
Pelzer, S. C.	6	13	17	14.0	14
Chappells, S. C.	13	13	16	28.7	14
Catawba:					
Catawba, N. C.	8	13	17	35.0	14
Catawba, S. C.	11	14	17	24.3	16
Broad: Blairs, S. C.	14	14	17	31.6	16
Congaree: Columbia, S. C.	19	15	17	26.2	16
Wateree: Camden, S. C.	23	16	18	30.5	16
Santee:					
Rimini, S. C.	12	16	27	18.4	20
		28	30	13.0	29
Ferguson, S. C.	12	18	[3]	14.1	21–22
Broad: Carlton, Ga.	15	12	14	21.0	13
Savannah:					
Calhoun Falls, S. C.	8	13	15	10.2	13
Augusta, Ga.	32	13	16	40.9	14
Clyo, Ga.	11	17	31	23.6	21
Ogeechee:					
Midville, Ga.	6	13	20	9.9	14
Dover, Ga.	7	17	28	12.2	19
Oconee: Milledgeville, Ga.	20	13	15	23.4	14
Ohoopee: Reidsville, Ga.	17	16	18	19.6	17
Altamaha: Charlotte, Ga.	12	19	25	13.4	24
EAST GULF OF MEXICO DRAINAGE					
Chattahoochee: Norcross, Ga.	16	15	15	18.1	15
Etowah: Cartersville, Ga.	18	13	14	19.8	14
Pearl: Pearl River, La.	12	[3]	9		
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Rock: Moline, Ill.	10	29	Sept. 1	10.3	31
Missouri Basin					
Grand: Chillicothe, Mo.	18	14	14	18.6	14
Ohio Basin					
New:					
Ivanhoe, Va.	15	13	15	32.1	14
Radford, Va.	14	14	15	34.1	14
Glenlyn, Va.	11	14	16	27.6	14
		31	31	12.1	31
Hinton, W. Va.	14	14	15	18.5	15
Kanawha: Kanawha Falls, W. Va.	25	15	15	31.7	15
North Fork: Holston: Mendota, Va.	8	14	15	15.0	14
Watauga: Elizabethton, Tenn.	14	13	14	20.9	14
Holston: Rogersville, Tenn.	13	14	16	17.7	15
Nolichucky: Embreeville, Tenn.	8	13	14	18.6	13
		30	30	11.2	30
Big Pigeon: Newport, Tenn.	6	13	15	16.0	13
		30	31	17.3	30
French Broad:					
Asheville, N. C.	6	13	16	12.5	13
		29	Sept. 2	13.2	30
Marshall, N. C.	10	13	15	13.5	14
		29	31	23.0	30
Hot Springs, N. C.	13	14	14	15.2	14
		29	31	22.3	30
Dandridge, Tenn.	12	14	16	18.7	15
		30	[2]	20.9	31
Tennessee: Knoxville, Tenn.	20	15	16	23.95	16
		31	31	20.4	31
Arkansas Basin					
North Canadian:					
Woodward, Okla.	5	8	9	6.0	9
Canton, Okla.	8	9	10	9.1	10
Yukon, Okla.	8	10	17	11.7	11

[2] Continued into next month.
[3] Continued from previous month.